Geographical Distribution of Pyraustinae (Lepidoptera: Pyralidae) of temperate East Asia

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Taxonomic and Geographic Scope

This paper gives qualitative impressions based on a detailed taxonomic and biogeographic study now being carried out on the rich subfamily Pyraustinae as represented in Temperate East Asia. The area considered in this study is the vast one north of the Himalaya and east of the western boundary of China. It includes: all of China, the USSR east of a line extending north along approximately the meridian of 75°E longitude from the western border of Sinkiang, Mongolia, Korea and Japan. A considerable number of species extend at higher altitudes into the Himalayan areas of Pakistan, India, Nepal, Sikkim, Bhutan, and Upper Burma. These elements are taken into account, but the general faunas of those countries are not considered. The known fauna of Pyraustinae of this area comprises at least several hundred species, probably 1000 or more, though not all genera are fully worked out as yet. Collecting has been uneven. Several of the more interesting areas, such as Japan, Suchwan Province of China, and the Amur-Ussuri region of the Far-East USSR, have been relatively thoroughly collected. Substantial collections have come from a number of other localities, mostly as the result of single season's collecting. Although these collections give a good general picture, it is certain that they leave many major gaps, both because of species missed at the localities sampled and also because of endemism in the many mountain ranges and special habitats that have never been systematically sampled.

Our taxonomic work is not yet far enough advanced to let us give quantitative tabulations, but we can make several generalizations that we believe will prove valid, and we present some typical or interesting distributional patterns. Unfortunately most of the material that we have studied has been collected without definite ecological correlations, and we therefore cannot relate distributions except in a very rough way to the vegetational patterns worked out by such authors as WANG.

Major Biological Zonation

The region under study comprises a wide range of ecological habitats, with zonation in latitude, altituded, and temperature, precipitation, continentality, seasonal region and many associated physical and biotic factors. In a very simplified overall picture we can distinguish five major faunal areas or components: (1) A northern area, containing transcontinental Holarctic or Palaearctic elements and a few Beringian ones; this area includes Arctic, subarctic and boreal zonal subdivisions. (2) A high, dry interior-Asian zone, containing eremic and mountain elements, with direct affinities westward and extending from Sinkiang northeastward into Mongolia and Kansu and southeastward into Tibet. (3) A Himalayan-West Chinese mountain area, with a large endemic faunal component mixed with subtropical and tropical Indo-Malayan elements. (4) A Far-Eastern temperate forest area, including much of eastern and central China and most of Japan. (5) A tropical lowland area, extending into the lowlands of southern China, into the Ryukyu and in alternated form into southern Kyushu.

The last three areas are intermixed in a complicated way depending on topography and on diffusion of faunal elements. All three, but the last two especially, are profoundly modified by prolonged human occupation. A large proportion of the natural habitats have been destroyed or greatly impoverished, and it is likely that many species have become extinct as a result.

For a detailed account of the vegitational geography of the Chinese portion of this area the reader

is referred to Wang (1961). Wang emphasizes the division between western grassland-desert and eastern forested areas, and therefore makes a primary separation of our Area 2 from the remainder. Kostrowicki (1969), on the other hand, in his valuable and painstaking analysis of the Palaearctic fauna of Papilionoidea, gives more weight to latitudinal zonation and to proportional composition of the fauna. His regionalization based on the whole Macrolepidoptera (1969, Fig. 43) shows considerable resemblance to our scheme: his Area 1 (Arctic Subrealm) corresponds largely to our Area 1; his Areas 4 and 5 (Tibetan Province and Central Asiatic Region) correspond in large part to our Area 2, though his Tibetan Province includes also part of our Area 3; his Area 3 (East Asiatic Province) and Area 10 (Oriental Realm) correspond in principle to our Areas 4 and 5, though we have dealt somewhat differently with the ambiguities caused by faunal differentiation.

Area 1. Northern Area

This area, extending across Siberia to Kamchatka, and south to blend in the Amur-Ussuri region with Area 4, has a relatively restricted and in its northern and northeastern parts poorly known pyraustine fauna. It includes arctic, subarctic, boreal and temperate components, and holarctic, transpalaearctic and Beringian elements in the different faunal zones. We do not definitely know any truly arctic component, but we suspect strongly that the American Beringian species *Udea gibsonalis* (McD.) (Fig. 1), known from northern Alaska and the Pribilof Is., will prove to occur also in Siberia. In the subarctic zone the Beringian *Udea washingtonalis* (GRT.) (Fig. 1) ranges through southern Alaska and the Pribilof Is. to Kamchatka; the species occurs south well into the temperate zone on the American side, but apparently not in Asia. The holarctic *Udea itysalis* complex occurs in boreal and subarctic habitats widely across the mountainous and taiga areas of the Holarctic zones, extending south to Arizona, the Central Asian mountains and the Great Atlas of North Africa (not figured).

There are many examples in this Area of transpalaearctic species and groups. Among these we may mention *Opsibotys fuscalis* (D. & S.) and its relatives, and *Eurrhypara hortulata* (L.). Both of these have relatively uniform populations from Europe to Amur, but are represented by complexes of close but distinct species in different parts of China and Japan (Fig. 2). *Opsibotys* differs from *Eurrhypara* in that it is represented in Japan, whereas *Eurrhypara* is confined to the mainland. Other species, such as *Udea nyctemeratis* (HBN.), *Phlyctaenia perlucidalis* (HBN.) and *Ostrinia quadripunctalis* (D. & S.) have a similar transpalaearctic range, but lack representatives in China or Japan.

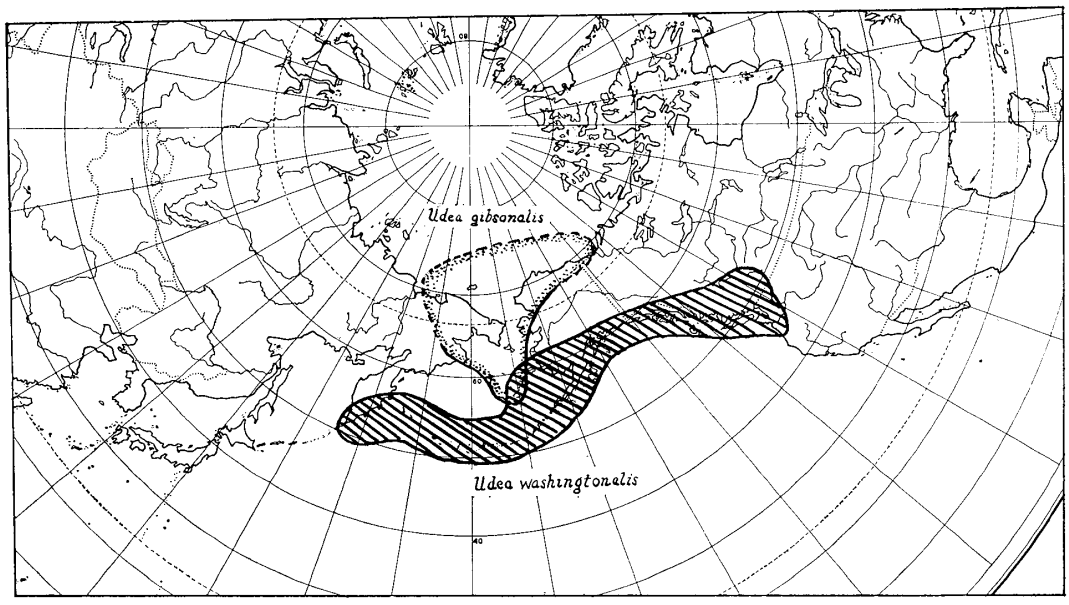

Fig. 1. Distribution of *Udea gibsonalis* and *U. washingtonalis*.

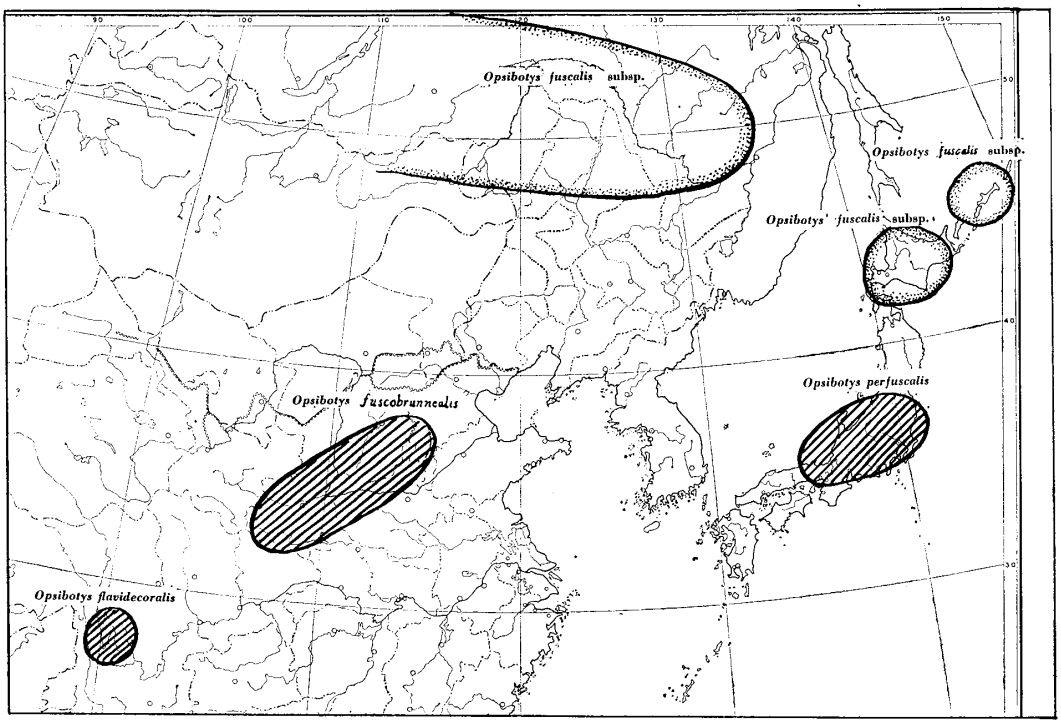

Fig. 2. Distribution of *Opsibotys*.

Area 2. Interior-Asian Area

This includes, first desert and steppe species; secondly species of forested and tundra zones of mountain ranges within predominantly desert and steppe regions. The insect fauna agrees with Wang's vegetational analysis in presenting a strong contrast to the remaining zones. There are many endemics, but also a strong western character, caused by the presence of species with relationships to the middle-eastern and west-Asian deserts and to Alpine and west-Asian mountain and grassland faunas. Such species as *Loxostege xuthusalis* exemplify the endemic element; *Antigastra catalaunalis* (DUP.), *Euclasta* spp. and *Achyra nudalis* (HBN.) represent the eremic and grassland elements; the *Udea alpinalis* and *Panstegia postalbalis* groups represent the alpine element. Some of the eremic elements also have relationships in America. The otherwise Nearctic genus *Choristostigma* WARREN, has, for example, a single species is Turkistan.

Area 3. Himalayan-West-Chinese Mountain Area

This is an area of great contrasts of altitude and rainfall. We restrict this area to the wetter subtropical and temperate forests and to the Himalayan, Burmese and southwest Chinese alpine faunas that occur adjacent to them. This fauna includes several different components. First there are species or groups basically tropical in their relationships, such as *Neadeloides* BOYK. Second are species or genera whose relationships are to the temperate forest fauna of Area 4. A good example is the genus *Parbaltia* MOORE, (Fig. 3) which except for an isolate in Taiwan is confined to Area 3, but is closely allied to such genera as *Nomis* in Area 4, and *Paranomis* which spans Areas 3 and 4. Finally, there are high-altitude forms such as the *Pyrausta sikkima* group, which are more closely related to temperate faunas.

Area 4. Far-Eastern Temperate-Forest Area

This large area intergrades in a complex pattern with Area 1 on the north, where the Amur-Ussuri region is already mixed and with Area 5 on the south, where temperate elements occur at higher altitudes along with basically tropical ones in Taiwan and various mountain ranges of the mainland.

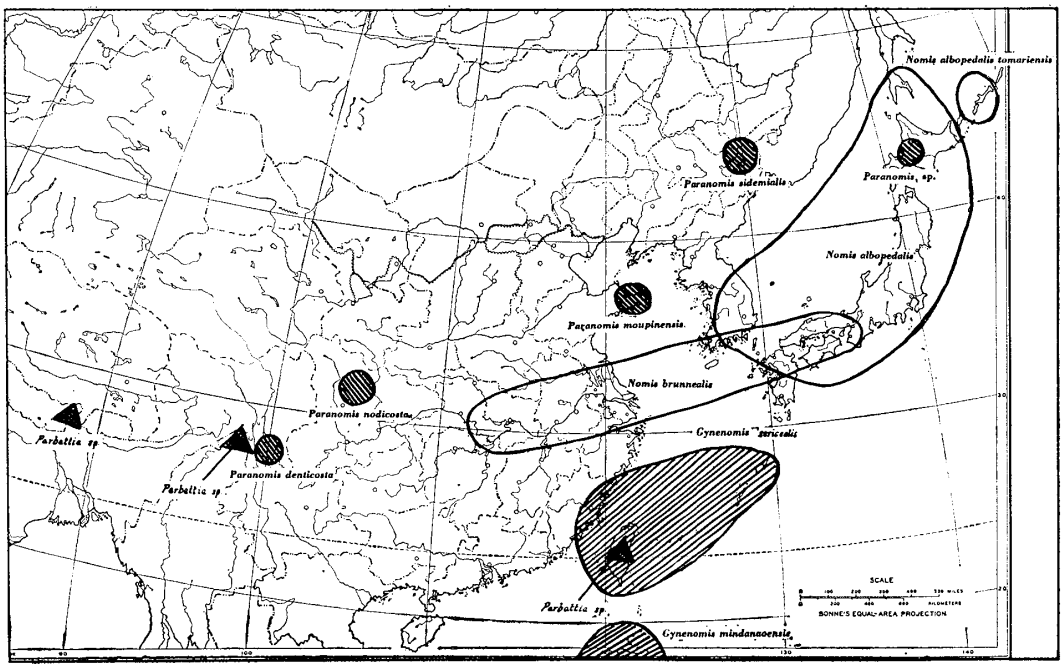

Fig. 3. Distribution of *Nomis*, *Paranomis*, and *Parbattia*.

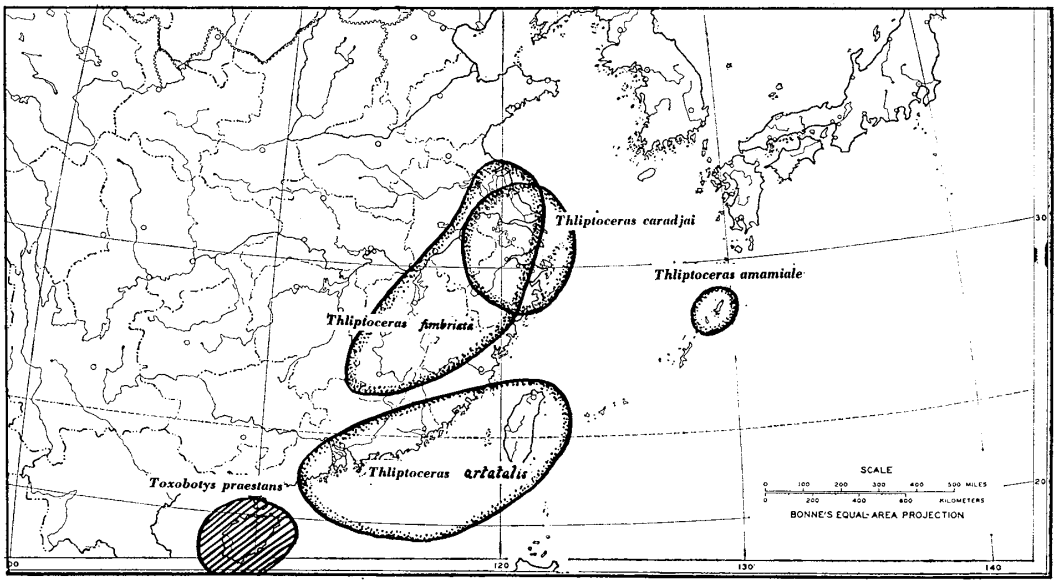

Fig. 4. Distribution of *Thliptoceras* and *Toxobotys*.

The number of endemics is notable. Some are of northern Palaearctic affinity, e. g., *Opsibotys* spp. and *Eurrhypara* spp., already mentioned, or the *Anania assinulis* (BUTLER) group. Others are of southern affinity, e. g., *Thliptoceras fimbriata* (LEECH) and *T. caradjai* MUNROE and MUTUURA (Fig. 4). Still others, such as *Nomis* MOTSCHULSKY, *Proteurrhypara* MUNROE and MUTUURA, *Demobotys* MUNROE and MUTUURA, *Pseudebulea* (Fig. 5) and many others, are endemic. These last have a strong tendency to extend westward into Area 3. It is well known also that certain species of this faunal area have representatives in the corresponding zones of Europe and America. An example of the former is the genus *Microstiga* HBN. (*Paratalanta* MEYRICH), of which the *ussuralis* group, with a number of species in Area 4, is represented by disjunct species in the Caucasus and western Europe. An example of the latter is *Herpetogramma moderatalis* (CHRISTOPH), which is directly related to the

North American *Herpetogramma aeglealis* group (Fig. 6).

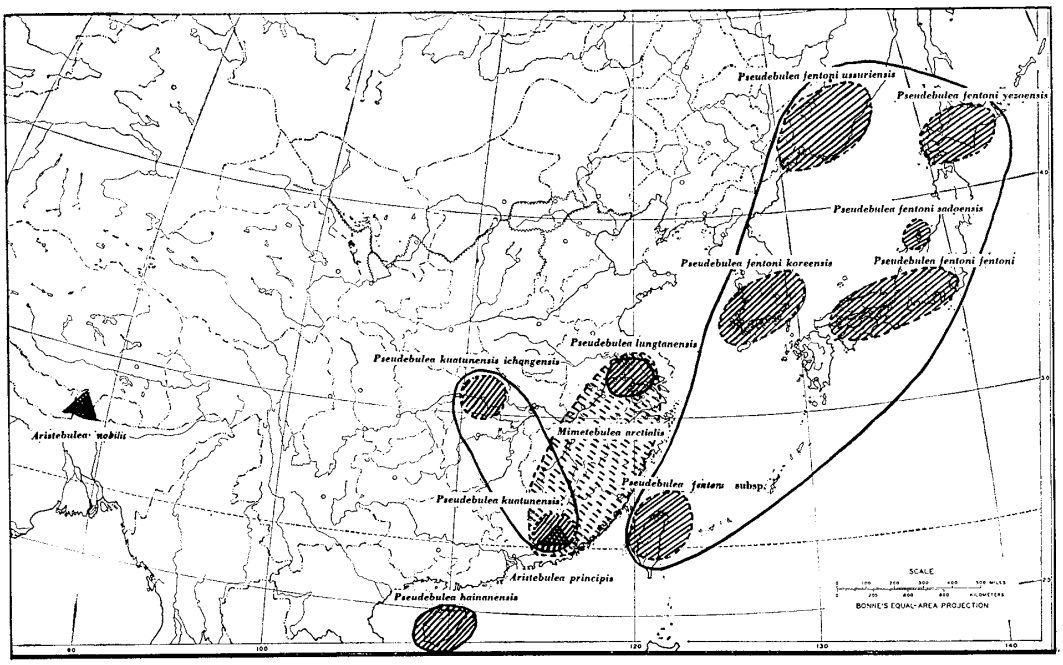

Fig. 5. Distribution of *Pseudebulea*, *Aristebulea* and *Mimetebulea*.

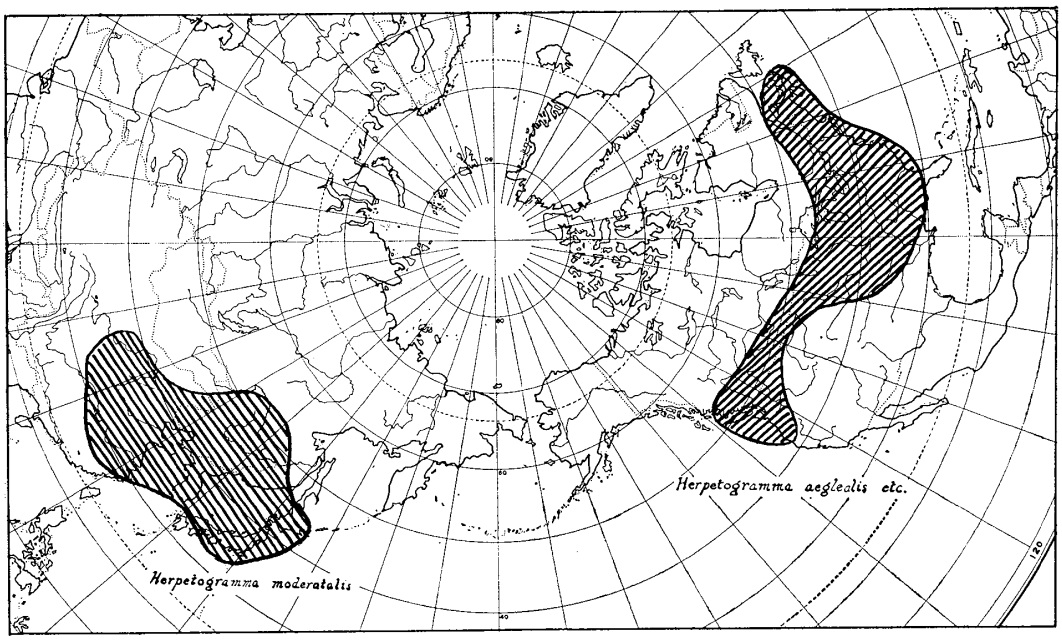

Fig. 6. Distribution of *Herpetogramma moderatalis* and *H. aeglealis*.

Area 5. Tropical Lowland Area

A very large number of tropical Asiatic species and species-groups enter South China, Hainan, Taiwan and the Ryukyu. Indeed such species predominate in the faunas of these areas. We can mention *Botyodes asialis* (GUENÉE) as an example of a widespread, common species, and *Thliptoceras artatale* (CARADJA) as an example of a rare, local one. There is also an insular component, of which the genus *Gynenomis* MUNROE and MUTUURA, known from the Philippines, Taiwan and the Ryukyu

is an example. The tropical fauna, too, appears to have some endemics, such as the remarkable *Toxobotys praestans* MUNROE and MUTUURA known so far only from Hainan.

General Patterns

We have not yet progressed far with the historical or statistical analysis of patterns. Such complex differentiation of a mainly temperate group as is shown by the *Nomis* complex (Fig. 3) certainly opens interesting lines for speculation. Other distributions, such as the differentiation in Areas 3 and/or 4 of such tropical groups as *Thliptoceras* (Fig. 4), or such temperate ones as *Opsibotys* and *Eurrhypara*, are more straightforward. With more time and work we hope to be able to arrive at interesting general conclusions.

References

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Wang, Chi-Wu, 1961. The forest of China, with a survey of grassland and desert vegetation. Maria Moors Cabot Foundation Publ. No. 5, Harvard Univ., Cambridge Mass. 313 pp.

スジグロカバマダラを石川県南部で採集

小　坂　　巌
石川県小松市古河町 121

スジグロカバマダラ *Salatura genutia* CRAMER は，これまで九州の諸県，対馬，四国の3県，近畿，東海，関東の南部の各都府県において採集および目撃の記録があるが，これらはすべて太平洋側に限られていた．

1970年9月27日，石川県南部の小松市日末町で，小学校4年生の近藤良二，桑折知幸の両君が本種を採集した．これは，本邦における本種の最北限の採集とおもわれるので報告する．

採集地は日本海に面した砂丘地と水田の間であった．

採集された個体は新鮮なものであり，わずかに前翅末端部の鱗粉がとれていた．

1♂，石川県小松市日末町，27. ix. 1970，近藤良二，桑折知幸採集（小松市立博物館保管）．

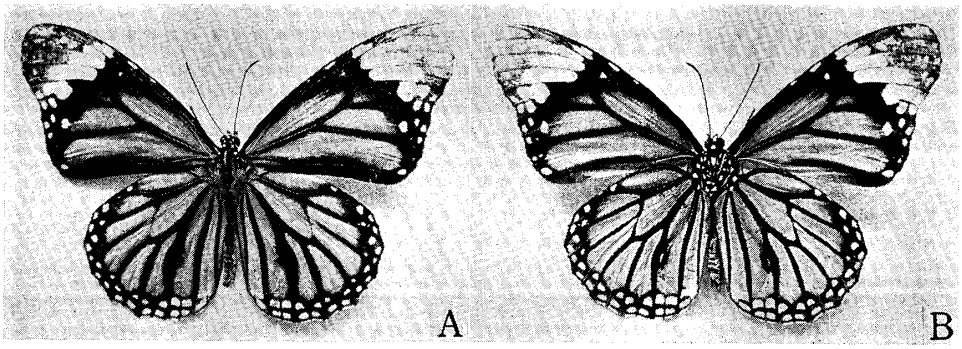

Fig. 1. *Salatura genutia* CRAMER スジグロカバマダラ♂．A．表面，B．裏面．